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The taxonomic status of "*Macrotherium* cf. *M. brevirostris*" from the Middle Miocene of Jiulongkou, Cixian County, Hebei Province

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Key words　Jiulongkou, Cixian County, Middle Miocene; Chalicotheriidae, new species

Summary

Materials of chalicothere from Jiulongkou, Cixian County, Hebei Province were identified as *Macrotherium* cf. *M*. *brevirostris* by Hu (1959) and *Macrotherium* sp. by Chen and Wu (1976). However, *Macrotherium* was *Nomen nudum* and erected as *Chalicotherium* by Anquetin et al. (2007). Recent phylogenetic analysis (Chen et al., 2012) and new discoveries from Tunggur (Liu and Zhang, 2012) showed that the Cixian materials were markedly distinct from *Chalicotherium brevirostris*. Further observation and comparison suggest that the Cixian materials should represent a new species.

Class Mammalia Linnaeus, 1875
Order Perissodactyla Owen, 1848
Family Chalicotheriidae Gill, 1872
Subfamily Chalicotheriinae Gill, 1872
Genus *Chalicotherium* Kaup, 1833
***Chalicotherium hebeiense* sp. nov.**

(Figs. 1–2)

Macrotherium cf. *M*. *brevirostris* Hu, 1959, pp. 129–130, pl. II–III
Macrotherium sp. Chen and Wu, 1976, p. 8

Holotype　IVPP V 2406.1 (Fig. 1A), an almost complete mandible with left and right p3–m3, only the tip of the snout part broken.

Referred specimens　IVPP V 2406.2, a broken scapula; V 4832.1 (Fig. 2B), a right P3; V 4832.2 (Fig. 2A), right DP2–4; V 4832.3 (Fig. 2C), a broken juvenile occipital.

Locality and horizon　Jiulongkou in Cixian County, Hebei Province; Jiulongkou Formation, Tunggurian, Middle Miocene (Deng, 2006).

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Etymology Hebei, from Hebei Province, where the fossil site is located.

Diagnosis The mandible is robust; the symphysis is thick, and its posterior margin is at the level between p4 and m1; the mandibular corpus is deep and the depth increases posteriorly; the angulus mandibulae expands ventrally; the premolar row is markedly shorter than the molar row; the central valley of P3 is closed; the entoconid of p4 is conspicuous and isolated; the trigonids of lower molars are U-shaped, and their metastylids are weak.

Comparison and identification On the basis of the size, the U-shaped trigonid and the development degree of metastylid on lower molars, the chalicothere specimens from Jiulongkou can be identified as *Chalicotherium* and resemble *C. brevirostris* the most. But the Jiulongkou specimens represent a different species from *C. brevirostris*. V 2406.1 has different ratio of width to length on the lower cheek teeth and different development degree of cingulum from the *C. brevirostris* materials from Tunggur. More distinct characters can be observed on V 2406.1: 1) the symphysis is stronger and its margin extends more posteriorly than that of *C. brevirostris*; 2) the mandibular corpus is deeper than that of *C. brevirostris*. Among the newly described specimens from Jiulongkou, the P3 (V 4832.1) also displays some differences from the type specimen of *C. brevirostris*: 1) the paracone is the highest point on the ectoloph of this worn tooth, but for *C. brevirostris* the metacone is the highest; 2) the parastyle is weaker than that of *C. brevirostris*; 3) the protoloph connects the base of protocone and makes the central valley closed, while this loph is shorter on *C. brevirostris* and makes the central valley open.

In conclusion, the chalicothere fossils from Jiulongkou are different from *Chalicotherium brevirostris* from Tunggur. They should represent a new species, here named as *C. hebeiense*. Additionally, a mandible fragment from Qaidam Basin (IVPP V 12531), with a few different characters from V 2406.1, is regarded as *C. hebeiense* temporarily.

河北磁县九龙口中中新世 “*Macrotherium* cf. *M. brevirostris*” 的分类地位

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摘要：河北磁县九龙口是我国东部地区一个比较重要的中中新世化石地点，该地点出土的爪兽化石的分类地位一直未能确定。近年来的系统发育分析和通古尔地区新材料的研究显示，九龙口的爪兽应当是 *Chalicotherium* 属内一个未定名的新种，本文将之命名为 *C. hebeiense* sp. now.。该种以下颌粗壮、下颌联合的后缘在p4-m1之间、下颌支深、前臼齿列短、P3中谷封闭、p4下内尖发育且孤立、下臼齿的下三角座U型及下后附尖弱等特征为鉴

定依据。柴达木盆地曾经发现过的一段下颌残段(IVPP V 12531)也可暂时归入此种。

关键词：河北磁县九龙口，中中新世，爪兽科，新种

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河北磁县九龙口曾经出土了数件中中新世时期的爪兽化石，被鉴定为*Macrotherium* cf. *M. brevirostris*和*Macrotherium* sp. (胡长康，1959; 陈冠芳、吴文裕，1976)。“*Macrotherium*” *brevirostris*是基于内蒙古通古尔地区发现的一件破损的头骨和部分头后骨骼建立的(Colbert, 1934), 但后来*Macrotherium*作为无效属名而被撤销，此种被归入*Chalicotherium*属中(Anquetin et al., 2007)。陈少坤等(2012)对爪兽亚科(Chalicotheriinae)做了系统发育分析，系统树显示与磁县标本最为接近的不是*Chalicotherium brevirostris*, 而是*C. goldfussi*。但由于*Chalicotherium*属内各种的标本材料很不对等，磁县标本为下颌骨，*C. brevirostris*则是头骨，在*C. goldfussi*能提取到的头骨和下颌骨特征数据也很少，因此*Chalicotherium*属内各种之间的关系在陈少坤等(2012)的系统树中是不够稳定的。之后，Liu and Zhang (2012)描述了内蒙古通古尔的两件下颌骨(IVPP V 16308和V 16309.1), 基于时代、地理位置以及前臼齿与臼齿列长度之比将它们鉴定为*C. brevirostris*。仔细观察发现磁县和通古尔标本之间的差异是非常显著的，因此Liu and Zhang (2012)的结果支持磁县的爪兽化石与通古尔的*C. brevirostris*并非同种，本文建议将磁县标本另定一新种。

文中缩略语：IVPP, 中国科学院古脊椎动物与古人类研究所；AMNH, 美国纽约自然历史博物馆；L, 长度；W, 宽度。

哺乳纲 Mammalia Linnaeus, 1875

奇蹄目 Perissodactyla Owen, 1848

爪兽科 Chalicotheriidae Gill, 1872

爪兽亚科 Chalicotheriinae Gill, 1872

爪兽属 *Chalicotherium* Kaup, 1833

河北爪兽(新种) *Chalicotherium hebeiense* sp. nov.

(图1–2)

Macrotherium cf. *M. brevirostris* 胡长康，1959, pp. 129–130, pl. II–III

Macrotherium sp. 陈冠芳、吴文裕，1976, p. 8

正型标本　IVPP V 2406.1 (图1A), 一个近乎完整的成年个体的下颌骨，带有左、右p3–m3, 下颌骨吻部前缘部分未保存，左m3及右m2破损。该标本曾被胡长康(1959)鉴定为*Macrotherium* cf. *M. brevirostris*。

其他标本　IVPP V 2406.2, 肩胛骨破块，保存有部分肩胛冈及肩峰；V 4832.1 (图2B), 右P3; V 4832.2 (图2A), 右DP2–DP4，刚开始磨蚀；V 4832.3 (图2C), 幼年个体的枕骨残块，与V 4832.2可能属于同一个体。V 2406.2曾被胡长康(1959)鉴定为*Macrotherium* cf. *M. brevirostris*; V 4832.1–3曾被陈冠芳、吴文裕(1976)鉴定为*Macrotherium* sp.。

产地及层位　河北磁县九龙口，中中新世通古尔期，九龙口组(Deng, 2006)。

种名来源　Hebei, 河北省的汉语拼音，化石产地位于河北。

鉴定特征　下颌粗壮；联合部厚重，后缘在p4–m1之间；水平支深，且自前向后逐

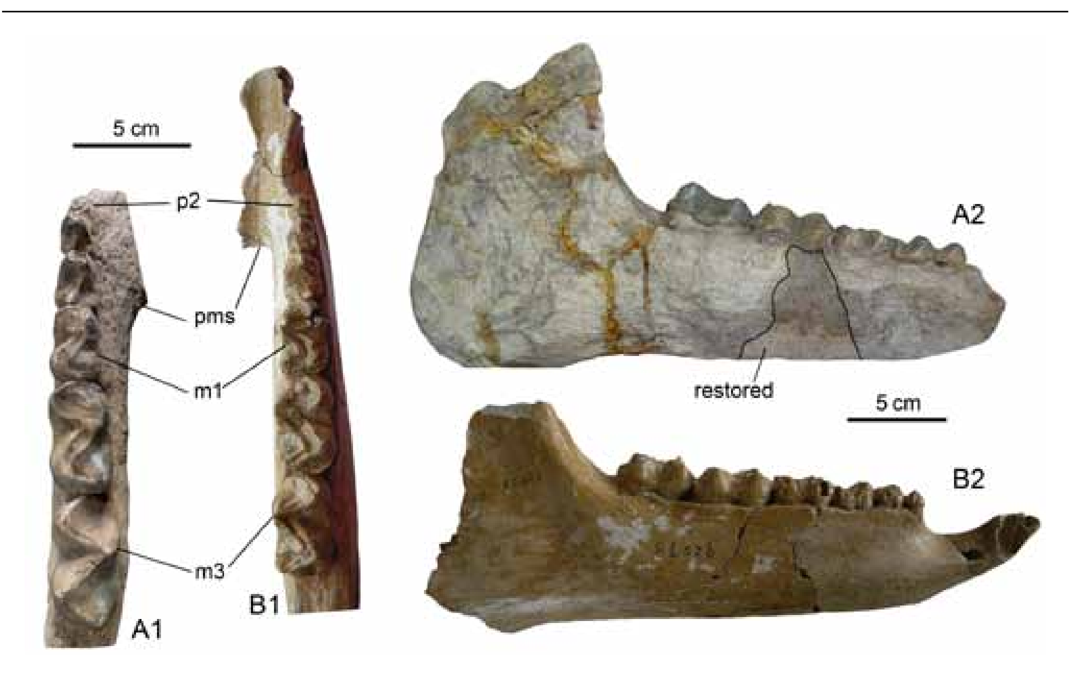


图1 河北爪兽(新种)的正型标本及与短吻爪兽下颌骨的比较

Fig. 1 Holotype of *Chalicotherium hebeiense* sp. nov., and comparisons with *C. brevirostris*
A. *C. hebeiense*, IVPP V 2406.1 (holotype); B. *C. brevirostris*, IVPP V 16308; 1. crown view of lower check teeth and symphysis; 2. lateral view of mandible; abbreviation: pms. posterior margin of symphysis

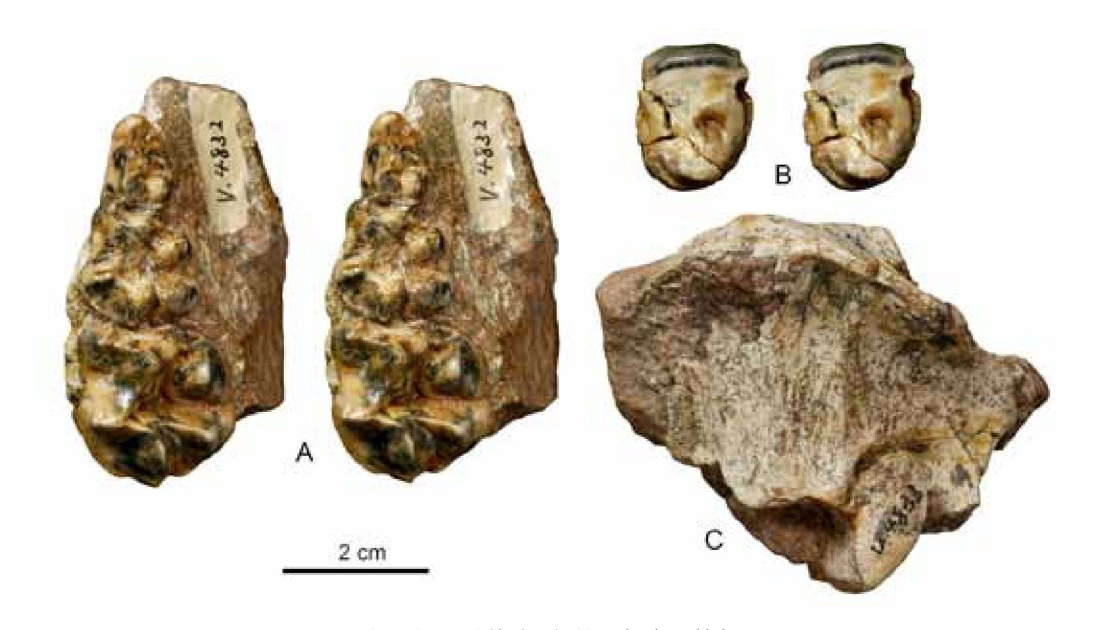


图2 河北爪兽(新种)的上颊齿和枕部

Fig. 2 Upper cheek teeth and occipital part of *Chalicotherium hebeiense* sp. nov.
A. right DP2–4, IVPP V 4832.2, in occlusal view; B. right P3, V 4832.1, in occlusal view; C. broken occipital of a juvenile, V 4832.3, in occipital view

渐变深；下颌角突部向腹后侧膨大；前臼齿列显著小于臼齿列；P3中谷封闭；p4下内尖发育且孤立；下臼齿的下三角座呈U型，下后附尖弱。

描述　胡长康(1959)已经对正型标本(V 2406.1)和V 2406.2有过较为详细的描述，Liu and Zhang (2012)亦对V 2406.1进行了补充记述，本文不再赘述，仅对V 4832.1–3加以描述。

IVPP V 4832.1为一件磨蚀较深的P3。双齿根；外壁稍外凸，在外壁上前尖发育而后尖很弱，可见极弱的前附尖；原尖位于舌侧中间位置，外壁斜，内壁近垂直；原脊呈圆弧形，与原尖基部相连；后脊粗壮，到达原尖顶部；前、后两条脊封闭形成中谷；前、后齿带发育，前齿带多乳突；L × W: 16.1 mm × 19.4 mm。

V 4832.2为一磨蚀很浅的幼年个体右侧上齿列，所有乳齿具完全的臼齿形态，DP2略呈三角形，前窄后宽；外壁不平，端附尖发育，前尖最高，后尖稍弱；原尖非常弱，呈“点”状；次尖发达，圆锥状，近乎孤立；后齿带发育；L × W: 13.6 mm × 10.2 mm。DP3的外壁“W”型；后半叶不萎缩；前尖最高，前附尖和中附尖发育；原尖弱，圆锥状；次尖发育，三角锥形；原小尖低矮，原脊与原尖不相连；中谷开阔，在原尖和次尖之间的开口呈V型；仅有弱的后齿带；L × W: 16.4 mm × 16.1 mm。DP4与DP3结构类似，但有发育的原小尖和原脊，原脊通过原小尖与原尖的基部相连；前齿带发育而后齿带弱；L × W: 21.3 mm × 22.3 mm。

V 4832.3应当是幼年个体的头骨，很小。枕部低，枕大孔上缘至枕嵴的最小距离为35.5 mm; 枕面上缘弧形，中间低两侧高，枕嵴薄，向后突伸；枕大孔圆形，直径估计有14 mm; 枕髁小，卵圆形，从侧面看其走向与枕面基本一致；正中嵴与侧嵴之间的压迹深。

比较与鉴定　河北磁县出土的爪兽化石最早见于Young (1937)报道的一件左侧距骨，这件标本现已无从查询，其具体分类位置亦不能确定，但九龙口的其他几件爪兽化石无疑是属于Chalicotheriinae亚科的，根据其生存年代、尺寸大小以及U型下三角座可将之进一步鉴定为*Chalicotherium*。*Chalicotherium*属目前仅有两个种，*C. goldfussi*和*C. brevirostris*。*C. goldfussi*仅发现于欧洲，生存时代也仅限于晚中新世，在已发表的材料(Anquetin et al., 2007)中，其下臼齿的下后附尖发育程度远高于中国的此属标本。虽然在陈少坤等(2012)所做的系统发育分析中，与磁县爪兽最为接近的是*C. goldfussi*, 但从Liu and Zhang (2012)报道的*C. brevirostris*的下颌材料来看，它们下臼齿的冠面结构与磁县的爪兽(V 2406.1)更相似。因此与磁县爪兽标本最为接近的仍旧是*C. brevirostris*。

Chalicotherium hebeiense (V 2406.1)与*C. brevirostris* (V 16308 (图1B)和V 16309.1)相比，颊齿的结构相似，差异主要表现在：1) 牙齿长宽比不同，V 2406.1的下前臼齿长宽比稍小一些；2) 齿带发育程度不同，V 2406.1齿带更发育。若将三件标本的下颌骨作比较，它们的差异则更大：1) 下颌联合的形态和位置不同，V 2406.1下颌联合粗壮，后缘位于p4后缘，而V 16308和V 16309.1的下颌联合相对较弱，后缘在p3后缘水平；2) V 2406.1的下颌水平支比V 16308和V 16309.1深很多。

在仔细观察产自磁县的一件P3 (V 4832.1)之后，认为其与Colbert (1934)所描述的*C. brevirostris* (AMNH 26518)亦有很大差别：1) 外脊在磨蚀后形态不同，V 4832.1的最高点在前尖位置，而*C. brevirostris*在后尖位置；2) *C. brevirostris*的前附尖发育程度比

V 4832.1高很多；3) V 4832.1原脊与原尖基部相连使中谷封闭，而*C. brevirostris*此脊较短，原小尖存在，中谷不封闭。

综上所述，河北磁县的这几件标本是不同于*Chalicotherium brevirostris*的一个新种，本文将之命名为*C. hebeiense* sp. nov.。另外，出土于柴达木盆地的一件被Wang and Wang (2001)鉴定为*Chalicotherium* cf. *C. brevirostris*的一件下颌残段(IVPP V 12531)与V 2406.1之间只有微小的差异，可以暂时视二者为同种。

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